Aug 10th, 12:00 AM

AI in the Workplace: A Qualitative Analysis of Intelligent Employee Assistants

Jasmin Manseau
Queen's University, jasmin.manseau@queensu.ca

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Completed Research

Jasmin Manseau
Queen's University
jasmin.manseau@queensu.ca

Abstract

Voice-controlled technologies that are referred to as intelligent employee assistants are showing rapid adoption in organizations. The nature of work is changing, and employees are facing disruptions that could have both positive and negative impacts as the work becomes more digital, and interactions with artificial intelligence become more common. This paper employs a grounded theory approach to study the use of intelligent employee assistants in the workplace. Data is collected by interviewing working professionals and is analyzed employing grounding theory techniques. This paper develops a framework of the use of intelligent employee assistants that explains that they are used to search for information, automate work processes, and augment employee capabilities. Results help improve our understanding of the use of intelligent employee assistants and provide guidelines for organizations considering their deployment.

Keywords

Grounded theory, intelligent employee assistant, intelligent assistant, natural language.

Introduction

There has been the emergence of intelligent personal assistant applications in all areas of our life. Intelligent personal assistants such as Siri, Cortana, Alexa and Google Assistants are applications found in smart electronics such as smartphones, computers and tablets. The market for these applications is expected to grow significantly by 2021 (Brill, 2018) and these applications have attracted attention in the business world. Organizations are beginning to adopt similar applications named intelligent employee assistants (IEA). Gartner recently stated that 2% of digital employees are using IEAs in the workplace. This number could increase to 25% by 2021 (Omale, 2019). Companies such as IBM, Facebook, Google, Microsoft, and Amazon are AI pioneers (Watson, 2017). Literature and practitioner outlets such as Gartner describe these applications as being implemented and deployed by organizations to support employee productivity. IEAs may change how employees perform tasks and processes at work. Investigating how technologies transform our work (Agarwal & Lucas, 2005) are core properties of the management information system (MIS) discipline.

Since IEAs have recently appeared in the workplace, there is sparse empirical evidence demonstrating how employees interact with IEAs. This paper leverages the study of intelligent personal assistants, such as Siri, Cortana, Alexa and Google Assistant as prominent applications on the consumer market to understand the literature surrounding intelligent employee assistants. From the perspective of consumer applications, little empirical evidence exists surrounding the benefits and performance improvements of communicating with intelligent personal assistants (Manseau, 2019a). This stream of literature focuses mostly on the design of intelligent applications using natural language technologies, specifically automating routine tasks to improve productivity (Myers, Berry, Blythe, Conley, & Gervasio, 2007).

This study provides a framework to investigate the use of IEAs in the workplace. It uses a grounded theory approach (Glaser & Strauss, 1967) to develop a model based on ten interviews with working professionals from different industries that use IEAs. Using a grounded theory approach provides a method to analyze and segment interview data to observe significant relationships to develop a theoretical framework for IEA usage. This paper shows that there are benefits of using IEAs, such as reduced costs for the

organization, as well as improved efficiency by employees. However, some downsides will need to be considered by organizations in terms of the implementation of these systems as well as broader societal discussions about the nature of work.

The structure of this paper follows the process of grounded theory. First, the paper introduces the literature on IEAs and the research questions. The next sections present the grounded theory methodology, followed by the development and explanation of a framework of use. Finally, the paper discusses the contributions, limitations, and future research opportunities.

Literature Review - IEA

Intelligent employee assistants are considered a subcategory of intelligent assistant applications. The literature defines intelligent assistants as "an integrated system of intelligent software agents that help the user with communication, information and time management" (Azvine, Azarmi, & Nauck, 2000, p. 215). Intelligent employee assistants are applications that use natural language to receive requests and queries from employees to perform tasks. IEAs are defined as "IT artifacts that help employees via natural language to relieve employees from routine tasks, collaborates with employees, make recommendations and perform actions" (Manseau, 2019b). IEAs require data from users in the form of speeches or recordings. They are developed to respond to user requests by analyzing voice and text data.

Organizations develop IEAs to support their employees. Nokia has designed MIKA, an intelligent employee assistant for the telecommunication industry, to assist engineers with their complex tasks (Mohilay, 2017). IEAs are integrated into the various IS systems of the organization, which provides them with expert knowledge and real-time access to crucial internal and external information. Some IEAs can self-improve via machine learning. Pfeifle (2018) explains that Amazon Alexa's learning characteristics include real-time, dynamic and self-improving learning. Associating Alexa's user recordings with user accounts creates an interaction repository that allows the improvement of the capabilities of Alexa over time as the application learns the preferences of the user (Pfeifle, 2018). Intelligent employee assistants can change the way employees perform at work, according to Forbes magazine (Schawbel, 2018). IEAs represent a disruptive workplace technology because they can fundamentally change the way employees access information, perform tasks, and make sense of their environment. Researchers have highlighted that we need to understand better the process in which employees make sense of their workplace environment (Preece, Webberley, & Braines, 2015) when using intelligent applications, such as IEAs. In addition, applications such as Siri, Google Assistant, Alexa for Business and Cortana are consuming more and more information (Hauswald et al., 2016). System architecture and power consumption become more important design factors as an increasing number of users add computational pressures on data center architectures (Hauswald et al., 2016). Understanding how employees use IEAs could elucidate how employees make sense of their environment and could help organizations plan future projects.

Research Question

In order to investigate a phenomenon using grounded theory, researchers typically develop a broad set of research questions to focus on a phenomenon (Glaser, 1992). The research motivation of this study arises from the observation that intelligent assistants are migrating from the consumer market to the workplace (Omale, 2019), which led to the following research questions:

RQ1: How do employees use intelligent employee assistants at work?

RQ2: What are the outcomes of using intelligent employee assistants?

Grounded Theory

This paper employs grounded theory as a research methodology to answer these research questions. Grounded theory is a qualitative research methodology proposed by Glaser and Strauss (1967) that uses a set of prescribed steps to derive theory from data. It is an inductive process where data is systematically gathered and analyzed throughout the research process (Glaser & Strauss, 1967). It can be described as "a general methodology of analysis linked with data collection that uses a systematically applied set of methods to generate an inductive theory about a substantive area" (Glaser, 1992, p. 16). The grounded theory methodology provides a systematic approach to utilize data obtained from interviews to categorize

concepts and their relationships. It is an appropriate methodology to develop theory about a process that has not been researched extensively (Creswell, 2007). Since this research aims to explain how employees are using IEAs, a recent phenomenon (Omale, 2019), grounded theory is an appropriate method to analyze the interview data collected.

Data Collection

Interviews are an effective data collection method for grounded theory (Strauss & Corbin, 1998) and open-ended questions allow for further exploration of a phenomenon. This paper relies on ten interviews conducted over 30 days between July and August 2019. The average duration for the interviews lasted 30 minutes; the maximum and minimum duration for the interviews lasted 60 and 20 minutes, respectively. Ten respondents (eight males; two females) were recruited through forums of discussion such as the forum of discussion Alexa in Canada and Alexa for Business, as well as professional networks. Respondents included people from various ages, differing social and cultural backgrounds, and different levels of employment experience from sectors such as governments, technology, healthcare and financial institutions. The research aimed to obtain a sample of public and private sector organizations as well as small and large organizations. The average age of the respondents was 34 years, with a range of 22 to 53 years. Respondents had been employed on average for eight years. An interview protocol was developed for the interviews, which contained questions to understand employee reasoning for using IEAs. The interview protocol was tested with a doctoral student to ensure performance reliability. Interviews were recorded and transcribed for data analysis, and the researcher took detailed notes during the interviews.

During the interview process, respondents were asked to recall recent interactions with IEAs to minimize recall bias. Furthermore, the data was processed by reviewing each subsequent interview to achieve continuous improvement of the data collection.

Data Analysis

The analysis follows the process and techniques established by Glaser and Strauss (1967). The purpose of grounded theory is to develop a theoretical model that is a derivation of the data. The model emerges from the coding of data into concepts and identifying their resultant relationships. The coding of data includes three stages of coding: open coding, axial coding and selective coding. The process of coding is an iterative process that can occur in parallel as the researcher often withdraws from coding to contemplate and then later revisits the coding to interpret the data. Eventually, relationships are identified in the data and developed into a theoretical model.

Open Coding

The first step of the grounded theory process is open coding, which aims to analyze the transcripts of the interviews, as well as the notes taken during the interviews to organize the raw information into categories. It is a structured process of separating sentences or short aggregation of words as coded information that captures the patterns that emerge from the data. Categories can arise from in-vivo words that focus on spoken words or can be derived from the context of discussions (Glaser, Strauss & Strutzel, 1968). Open coding allows for a comparative analysis of all interview transcripts to develop a set of categories that group information based on similar characteristics or meanings, which make the data more approachable in finding inter-categorical relationships. Short sentences or word aggregates were coded in the context of the usage of IEAs. Initial categories created from the raw data can be seen in Figure 1. The author completed two reviews of open coding to inspect all transcripts in order to ensure that no sections were missed and that all categories were appropriately labelled with their corresponding respondents.

Categories	Open Coding Example
Improves efficiency to order goods	All transcripts are reviewed to highlight categories based on short sentences or words. For example the following : - *"Like if you want to get something, you know it's very easy, you just ask Alexa to get me this"* describes the easiness to order goods online.
Reduce wasted time such as driving	*-Right, your car becomes your work desk.*
Reduce HR costs	*-There may be an [HR] office for all the united states [instead of several] then the chatbot, it certainly reduces the costs, I use it, so I consider that in the long run it's less expensive*
Connected 24/7 even in the car	*-Requests come quickly, [...] it also has a slightly perverse effect that we must respond quickly [even in the car]*
Immediate gratification	*-You are efficient, but it also speeds up our life. You just work & you just live faster [...] like there is that feeling of rush & immediate gratification.*
Job losses	*-Jobs will be lost. It's like the cycle of life[...] like the pulp and paper guy who thought he was ok, but we computerized everything, so he lost his job*
Reduce social interactions	*-Efficiency hides other things. We still go to the grocery store and you talk to the guy and build a relationship. I'm not complaining about it, I live it. I'm also aware of the big cost we are paying.*
Automated dialing of contacts	*-We see it a lot in what is recognition of a contact management call [...] call such person or automate telephone dialing* *-As for Siri, I use it to book my hotel, [I say to Siri] call hotel x, even if it's not in my contact*
Automatic reminder	*-I end up relying on Siri a lot like reminding me to set up reminders or reminding me to actually send an email to someone like reminding me to send an email to my supervisor.*
Using it to search information online	*-I use [Siri] for online searches* *-Siri seems to me that it is very effective if we want to do some research on Google for example*
AI has a multiplicative power	*-It's like 10 people working for you at the same time*
Improve support of employees	*-You enter your data and you ask [the chatbot] what do you think, [the chatbot] gives you an analysis of your data, I find it interesting even for the person who is not a data analyst*
Privacy concerns	*- [I am] conscious as well that at any point in time Alexa could be recording right. That is something especially with the recent things, like Alexa have people wherever they are listening to words. Yeah that scares me a bit.*
Fear of being left behind	*- I think that we end up losing more if we don't use these technologies. Although they are compromising our privacy, if you are not using it, you are losing on it because everybody else is using them.*

Figure 1. Open Coding Categories

Axial Coding

In the second step, open coding categories are collapsed under higher-level categories as relationships begin to appear across categories. Axial coding produces associations between a category and subcategories based on common characteristics found in the data (Strauss & Corbin, 1998). This step adds depth to the analysis and helps with understanding the context of the data, which is the next step (Strauss & Corbin, 1998). The categories are organized into eight higher-level categories (Figure 2).

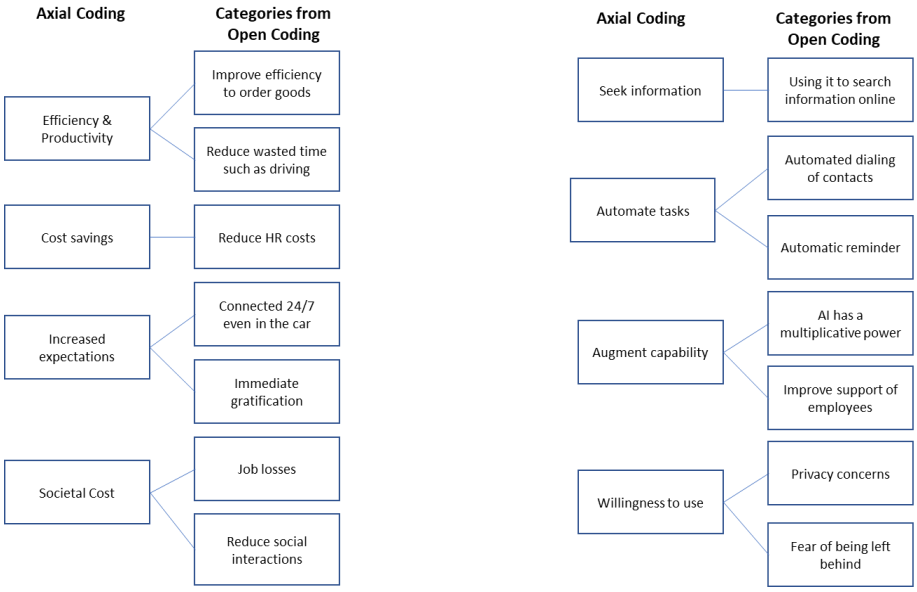

Figure 2. Example of Axial Coding

Selective Coding

While axial coding relates to the association of the open coding categories following identified patterns in the data, selective coding is focused on developing a theoretical model that results from the data (Glaser, 1978). In this final step, categories are incorporated into a core theme that allows the theory to be integrated (Glaser, 1978), which is how employees are using IEAs.

Findings

Strauss and Corbin (1998) proposed logic to help researchers identify patterns and relationships in the data. They proposed that there are conditions, actions and consequences that can be identified from the data which can help create a structure and establish relationships between a core theme and related categories. Conditions are the contextual elements needed for the use of the technologies. Actions are portrayed by the processes under which employees use IEAs. Consequences are expressed as the outcomes of the use of the technology. This logic is the foundation of the theoretical model developed in this paper and helps explain the relationships between the categories emanating from the data. Since the central phenomenon is the use of IEAs, this research proposes that IEAs are used to perform different actions such as to seek information, automate procedures and augment the capabilities of an employee. These actions lead to outcomes that can be positive such as increasing efficiency, productivity and providing cost savings but, contrastingly, can be negative such as increased expectations and societal costs, which would include job losses. The use of IEAs is, in turn, moderated by the willingness of employees to use the technology.

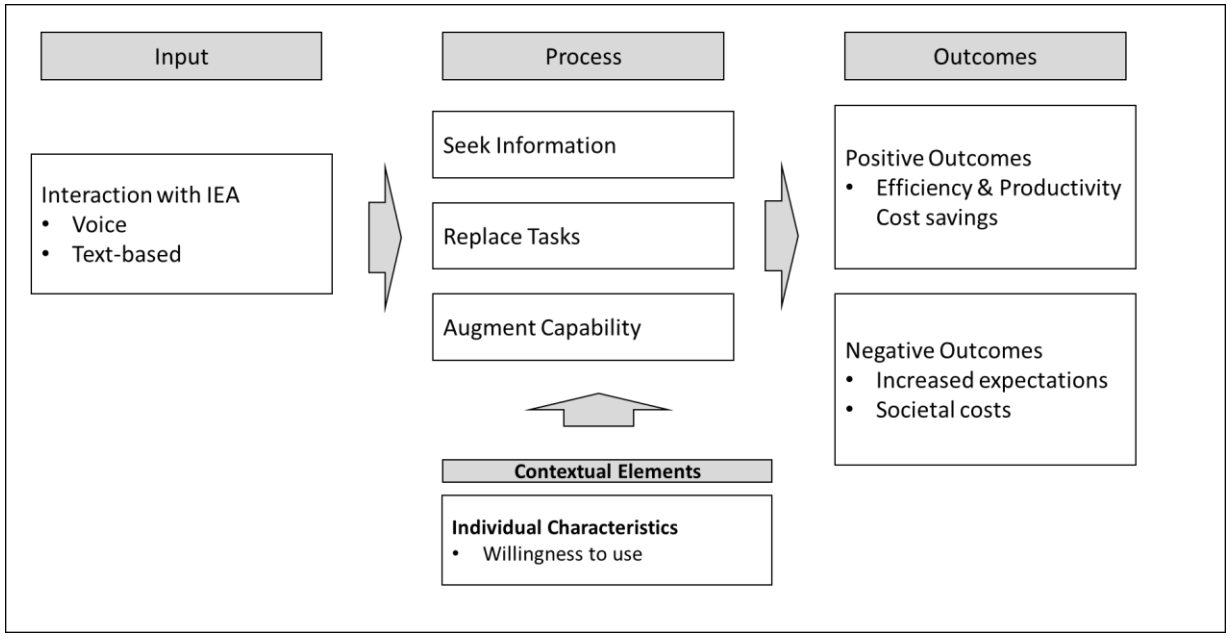

Figure 3. Framework of use of IEAs

Interaction with IEA

The first step of the model is the initiation of an interaction between an employee and an IEA. Respondents described how they interacted with the technology either using voice or by entering information via a keyboard. In some instances, both voice and text were used by respondents. One respondent mentioned that the intelligent application used at his work is designed to be as inclusive as possible with both voice and text capabilities.

> *[Our company] is very strong in inclusiveness, so when we make designs, we must make sure that it meets all the standards possible such as for people that cannot see as well, so it must be possible [to use an IEA] by a keyboard or by guiding with voice, everything must be functional in relation to that.*

This design feature is meant to overcome personal limitations and renders the technology more inclusive, which can be used by more employees. Another respondent stated that they interact with IEAs either via text or voice, depending on the situation.

> *I do not always have my glasses, and I see nothing, and it goes with age, when I do not have my glasses, I can dictate in the application of a note for my iPhone and it reproduces textually with little of errors.*

This highlights the importance of having multiple interaction techniques with IEAs. The first step in the completion of any employee task or request is to have interactions with an IEA verbally or textually. These requests or tasks initiated by the employee were grouped into the three types of processes of seeking information, automating tasks and augmenting capabilities.

Process – Seeking Information

Seeking information using IEAs aids in the process of gathering and searching for information for task completion. Respondents used this process to acquire additional information about a topic, identify a location, or search content online. With this, feelings of frustrations were echoed when the proper information was not obtained rapidly or when a long list of results from online search queries appeared. Employees described the use of IEAs as an instrument to research information on general knowledge, tasks, and interests. Many respondents described using Siri and Google Assistant to search the web and one respondent highlighted that:

> *Siri seems [that] it is very effective if we want to do some research on Google.*

Having access to information increases time efficiency, thereby transforming unproductive activities. For example, being provided with contact information through a voice request while driving saves employee time. A respondent stated that:

> *I use Siri to book my hotel at night, I call the hotel [while driving] even if it's not in my contact list.*

The search lightens the burden placed on employees, which previously would have required an in-person conversation. Respondents used this process as it was more convenient than traditional methods such as calling to obtain information. For some respondents, a motivating factor was that the technology was also fun.

> *I'm using Siri with Google, it's fast, simple and sometimes fun.*

The search performed by employees helped for simple tasks such as searching for music, maps and online queries and enabled respondents to find information more efficiently.

Process - Automating Tasks

Employees also used technology to automate tasks by preprogramming IEAs to perform manual inputs, such as ordering goods online. For example, office supplies can be purchased when the payment is pre-programmed for the purchase to be automated by simply stating what is required. An employee used the online ordering automation from Alexa to order office supplies more efficiently.

> *When you want to get something, it's very easy. You just ask Alexa to get me this, order that. Before it was the process of going there, now you get what you want faster.*

Just like how organizations divide their processes into a series of smaller tasks to understand where automation can benefit their business, employees were interviewed regarding automated parts of their work based on what could be accomplished. With this, employees adopted the IEAs to automate routine tasks with using current technologies. Employees purchased smart devices such as smartphones, tablets and car enabled technologies with voice recognition and learned to use the available technologies that support IEAs to improve their work by automating certain tasks.

Most automation tasks did not represent a significant amount of time savings for employees; however, they demonstrated how employees could be creative with the technology. One respondent described a more extensive application of work automation based on an organization-wide IEA, explaining that tasks that were once performed by individuals are now being transferred to the IEA.

> *When I am in the HR module, I cannot talk to anyone. I have to go through [the IEA] and I ask questions. I talk with the application until I get an answer. We are using [AI] in a large scale.*

Larger-scale automation may help improve workflows within the organization as well as better integrate information across functions, which can lead to a faster access to information. Whether at the organization-wide level or the employee level, IEAs show great promise for task automation.

Process - Augmenting Capabilities

Using the technology as an enhancer of capabilities is an additional process IEAs provide. Employees can benefit from the multiplicative power of artificial intelligence to increase their skill set. Respondents described using IEAs has a characteristic best described as being supported by many employees. A respondent expressed this idea.

> *We have built an AI that gets to know you. The software can suggest things and it will make an analysis. It is like ten people working for you at the same time.*

The technology is extending human capabilities and will allow employees and organizations to accomplish objectives that they could not have achieved before.

It should be noted that these processes can overlap and can be dependent upon one another. For example, an employee may first seek information on a task to be able to automate the task afterward.

Outcomes

This paper finds that outcomes can be grouped into positive and negative outcomes. Respondents mentioned several advantages and benefits of using IEAs at work, such as increasing productivity and efficiency. Respondents often alluded to the gain in productivity from using IEAs, especially with routine tasks such as scheduling meetings or using phone contacts. Respondents enjoyed the ease with which the technology interacted with them. Respondents stated that:

> *I just have to tell Siri to schedule something on that particular day and it works.*

> *I would say it saves me a little time too [when texting], especially when it's long messages.*

Several respondents stated that IEAs used in the car helped their work productivity by transforming inefficient time, such as driving into productive time. This increase in productivity was motivated by a need to be more productive but also by the organization's policies around driving that fostered the use of IEAs. One respondent noted:

> *We have a strict corporate policy where no cellphone behind the wheel is allowed, we have an application on our phone that detects the movement of the phone and blocks all incoming text messages and push notifications, so phone calls using IEAs are the only option.*

The policy of the corporation led indirectly to the adoption of IEAs in the car, transforming the car into a productive workspace. Another respondent stated that IEAs are life-changing technologies.

> *It really changed my life in terms of efficiency compared to my work. I use it at least ten times a day. Just this morning I used it six times, I took two notes, I called the hotel, I booked a restaurant, and I called at least five or six people.*

Another outcome described by respondents is the possibility to reduce costs for the organizations. A respondent stated that moving towards IEAs might reduce the cost of support functions by shifting these interactions towards the technology.

On the other hand, respondents also described unfavourable outcomes such as job losses and an increased dependence to stay connected 24/7. One respondent described a situation where an employee felt threatened by the technology.

> *Cortana [a Microsoft IEA] sent an email to a colleague and my colleague's secretary thought I had hired a new secretary. She ended up going back and forth with Cortana to schedule a meeting. She had no idea that this was a bot. I had to tell her that she was talking to an algorithm and that I did not hire a new secretary. She had no idea that she was fully communicating with Cortana, and for a moment, felt threatened for her job.*

One respondent described the job losses due to AI as a reality that society might have to learn to cope with over time.

> *I am not a fool; for sure jobs will be lost. It is the lifecycle. We recycle ourselves into something else, like the employee who once worked at the pulp and paper plant that thought he was OK for life, but we computerized everything, so he lost his job. Yet, the person who does the automation in the business has a new job. It is a circle.*

IEAs have the potential to improve and disrupt our lives as they will increase productivity by relieving users of routine tasks and providing access to information faster. This increase in productivity might also raise expectations from management to always be connected.

This paper describes this as the driving safely paradox where in order to seek a safer driving experience, the car is enabled by IEAs. While this increases the availability and reachability of the employee, it can be counterproductive in terms of expectations to respond instantaneously. This can impact safety since employees have an expectation to answer at any time, regardless of their situations. A respondent noted the following pervasive impact of IEAs.

> *I have seen all the technological eras. At the beginning of my career, I had no cellphone; email was present but not that much. Now we have the opposite with the pressure to respond instantly. Requests come quickly from above and below. My car enabled IEAs has a slight perverse effect that I must respond quickly now that I am enabled.*

Increasing productivity can have an adverse impact in terms of increased expectations from colleagues and management. A respondent noted that self-driving car capabilities might be a way to cope with this issue by increasing employee productivity while driving even more.

Outcomes identified in this research are both positive and negative. In some instances, the positive outcomes were balanced by adverse outcomes.

Contextual Elements

The willingness to use the technology varied across respondents. Several respondents expressed having privacy and security issues with IEAs. They expressed concerns about privacy and security issues not as an outcome, but rather as a reason for not using the technology. Respondents were concerned that third parties could listen to their interactions with IEAs, such as Amazon listening to conversations for technology improvements (O'Flaherty, 2019). Respondent stated that:

> *I am conscious as well that at any point in time, Alexa could be recording right. That is something, especially with recent things like Alexa, have people wherever they are listening to words. Yeah, that scares me a bit.*
>
> *I just feel that it's too young, too new and it will take more years to secure. You always hear stories about companies that listen, like the people on Facebook. It should be encrypted.*

Respondents dealt with privacy and security issues in different ways. Some respondents decided not to use it for personal use, while others surrendered to the technology. One respondent described the use of these new technologies as a necessity in order to remain relevant in today's workplace.

> *I think that we end up losing more if we don't use these technologies. Although they are compromising our privacy, if you are not using it, you are losing on it because everybody else is.*

As such, it is important to consider the variations in the willingness to use the technologies in the framework.

Discussion

The results of this study suggest that employees are using IEAs to search for information, automate processes and augment their capabilities. The interviews show that this process can occur in two ways. The majority of respondents stated that they found IEAs themselves to help with their work. This is a bottom-up approach where employees are using available applications such as Siri, Alexa, Google Assistant, to improve their work. They sought efficiency mostly to perform routine tasks such as searching information online, dialing clients and creating text messages. Employees did not customize applications;

instead, they tailored their work to the applications. Organizations should recognize that these applications are likely to be used at work and should have clear policies on their use, such as third-party applications like Alexa recording conversations with clients unknowingly. Organizations may also support employees by providing lists of safe applications or supported applications within the organization. This type of adoption was found to be dominant in the interviews with all respondents stating that they used one or more applications like Siri, Alexa or Google Assistants for various tasks.

Another type of use can be described as a top-down corporate implementation. Top-down adoption targets more sophisticated tasks. One respondent stated that his organization designed its own in-house IEA, which is now used company-wide. When an employee is hired, the employee must interact with the IEA application developed by the organization for human resources-related tasks such as requesting leaves and employee performance evaluation queries. Organization-wide IEAs are customized by the organization and are aimed at general usage. This type of adoption was found in only one respondent, which highlights the fact that this is still in the infancy stage. Organizations that are planning to develop corporate-wide applications should evaluate the needs of employees by providing text-based and voice-based interfaces to be as inclusive as possible.

Implications

The paper contributes to the body of knowledge around the use of intelligent employee assistants. It offers benefits to organizations by providing a better understanding of the use of IEAs. Companies that have policies on the use of smart technologies and driving can facilitate the adoption of IEAs by considering how employees make use of this technology in the workplace. Policies on privacy and security of the data should be discussed with employees to ensure guidelines provided by the organization are respected and fulfilled. Corporations that are considering the implementation of IEAs have several options such as implementing corporate-wide applications, or choosing to leverage existing applications.

Limitations

There are limitations to this research. This paper interviewed employees outside of their work environment and as such, recall bias may be experienced. Employees were asked to recall their latest experience with the technology to minimize recall bias. Another limitation is associated with the sample size of the study and the low incidence rate of individuals using IEAs, especially employees using in-house applications since companies are hesitant to have their employees disclosed information on these new technologies. Since it is a challenge to find individuals for interviews, convenience sampling was required and represents another limitation of this study. Finally, although the process of coding follows Glaser and Strauss (1967), the small sample size limits the generalization to a larger population.

Future Research

Future research could investigate IEAs as systems that continuously evolve and self-adapt to employees. For example, taking an adaptive structuration theory lens could provide more information as to how employees are adapting and how the technology is adapting back as a result. When interacting with IEAs, employees have also demonstrated that they are creative and adapt themselves to fit the technology by selecting applications that meet their needs. In order to help explain this process better, other theoretical lenses should be examined to analyze the relationship between the ultimate objective of the IEA to make sense of the requests made by employees and employees to make sense of the responses by IEAs.

Conclusion

The objective of this study is to understand how employees are starting to use intelligent employee assistants in the workplace. Through interviews, employees provided perspectives and shared their challenges with the technology, which allowed this paper to provide a framework to explain the use of IEAs. The framework derived from the data aims to provide the field with a better understanding of how employees use IEAs, and contributes to the body of knowledge around IEAs.

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